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EXAMINER

BARTON, JEFFREY THOMAS

ART UNIT

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1795

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/728,108

Applicant(s)

CHOU ET AL.

Examiner

Jeffrey T. Barton

Art Unit

1795

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 08 April 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 and 17-19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 17-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-8508)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 8 April 2008 has been entered.

Status of Rejections Pending Since the Office Action of 18 December 2007

2. All rejections of claim 16 are obviated by cancellation of the claim.
3. The rejection of claim 6 under 35 U.S.C. §103(a) as unpatentable over Kovacik et al in view of Gardner et al is withdrawn.
4. All other rejections are maintained.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 13, 14, and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by Kovacik et al. (US 2006/0107995)

Kovacik discloses a thermophotovoltaic generator as shown in figure 3.

Regarding claims 1 and 18, figure 3 shows the generator comprising a combustion chamber which comprises an internal chamber where combustion occurs (24 and 26; Paragraph 0013), with an internal expansion step (Step is immediately above tube 26 as illustrated in Figure 3), an emitter 28 engaged around the internal chamber and formed as a part of the outer wall of the combustion chamber, and a photovoltaic cell 14 in proximity to the emitter, configured to generate an electric current.

Regarding claims 13 and 14, the internal chamber (24 and 26) comprises first (26) and second (Directly above 26 in Figure 3) tubular sections, wherein the first section 26 has a cross-sectional width and diameter greater than those of the second section.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 2-5, 7-12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kovacik in view of Gardner et al. (U.S. 6,786,716).

The disclosure of Kovacik is as stated above in addressing claim 1.

Regarding claims 3 and 4, figure 3 of Kovacik shows a cylindrical outer wall for the combustion chamber and a backwards facing step immediately above section 26.

Regarding claims 5 and 7, Kovacik discloses that the emitter is matched to the characteristics of the solar cell (paragraphs 0027-0030), discloses use of SiC as a possible emitter. (paragraph 0027)

Regarding claim 8, Kovacik discloses the use of a filter, 16, between the emitter and the solar cell (paragraph 0031).

Regarding claim 9, Kovacik discloses the use of glass and dielectric filters, including multiple layers of dielectric materials (paragraphs 0033 and 0035).

Regarding claim 10, Kovacik discloses GaSb photovoltaic cells (paragraph 0029).

Regarding claims 11 and 12, Kovacik discloses burner design dependent on the type of fuel utilized.

Regarding claim 17, Kovacik discloses SiC being used to form portions of the combustion chamber. (Paragraphs 0013 and 0027)

The differences between Kovacik and the claims include the use of a platinum catalyst and the size of the device.

Gardner teaches a microcombustor as shown in figure 1 that utilizes platinum catalyst on the inside walls of the combustion chamber (column 7, lines 49-51). Gardner also teaches the microcombustor can have sizes less than a millimeter (column 5, paragraph 1).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the combustion size and platinum catalyst of Gardner within the combustion chamber of Kovacik because the microcombustor allows for lean burning at low flames and at temperatures less severe than with diffusion flames, thus enabling a longer system lifetime, reduced fuel consumption, and portable applications (Gardner column 3, paragraph 2) and the catalyst enables flame stabilization in the

microsystem, permits combustion with lean fuel/air mixtures, lowers the combustion temperature and extends materials limits of flammability (Gardner column 3, paragraph 2). Because Gardner and Kovacik are both concerned with combustion systems, one would have a reasonable expectation of success from the combination.

Regarding claim 9, as Kovacik disclosed, the choice of layers within the filter depends on the specific filter performance required for a specific application. In the absence of evidence of criticality, it would have been further obvious to choose a specific number of layers as within the claim and to use the specific materials of the claim as SiO_2 is a known dielectric and both Si and SiO_2 are within the glass disclosed by Kovacik.

Regarding claims 11 and 12, the choice of fuel and operating pressures are dependent on the specific application and would be obvious to one skilled in the art to make such choices. Further the small diameters of the claims are taught by Gardner for microcombustion systems and would be obvious to choose such diameters for the reasoning given above pertaining to microcombustion advantages.

11. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kovacik et al and Gardner et al as applied to claims 2-5, 7-12, and 17 above, and further in view of either Applicant's admitted prior art or Ferguson et al. (Materials Science and Engineering reference)

Kovacik et al in view of Gardner et al is relied upon for the reasons given above in addressing claims 2-5, 7-12, and 17. In addition, Kovacik et al suggests using

magnesium oxide emitters doped with d-series transition elements. (Paragraph 0029; cobalt and nickel are d-series transition elements)

Neither Kovacik et al nor Gardner et al teach an emitter formed of Co-/Ni-doped MgO ribbon or tape.

Applicant's specification teaches that it is known in the art that doping cobalt oxide or nickel oxide into MgO can produce matched emitters with continuous strong radiant emissions in the optimal energy range and minimal energy at nonconvertible wavelengths. (Page 7, lines 5-8)

Ferguson et al teaches that emitters matched to GaSb photovoltaic cells (disclosed by Kovacik et al at paragraph 0029) can be prepared by doping magnesium oxide with cobalt or nickel. (Abstract; Paragraph bridging pages 36 and 37) The emitters of Ferguson et al are tape cast. (Paragraph bridging pages 36 and 37)

It would have been obvious to one having ordinary skill in the art to further modify the system of Kovacik et al by specifically choosing Co-/Ni- doped magnesium oxide tape emitters, as taught by Applicant's admitted prior art or Ferguson et al, because Applicant teaches that it is known in the prior art that effective matched emitters are obtained by doping Ni or Co into magnesium oxide, or because Ferguson et al teaches the excellent emitter match to the GaSb cells disclosed by Kovacik et al. In addition, Kovacik et al suggest using d-series transition element-doped magnesium oxide as the emitter, further suggesting the obviousness of such an emitter selection.

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12. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kovacik et al and Gardner et al as applied to claims 2-12 and 17 above, and further in view of DePoy et al. (US 6,043,426)

Kovacik et al and Gardner et al teach a generator as described above in addressing claims 2-12 and 17.

Neither Kovacik et al nor Gardner et al teaches a system comprising InGaSb or InGaAsSb thermophotovoltaic cells.

DePoy et al teach a TPV system using heavily doped InGaSb or InGaAsSb cells (Column 2, lines 19-23; Column 5, lines 8-14)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Kovacik et al and Gardner et al by replacing the cells with heavily doped InGaSb or InGaAsSb cells, as taught by DePoy et al, because DePoy et al teaches that these cells provide improved efficiency and open-circuit voltage, among other advantages. (Abstract, Column 5, lines 8-14)

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kovacik et al in view of Fraas et al. (US 6,489,553)

Kovacik et al is relied upon for the reasons given above in addressing claims 1, 13, 14, and 18.

Kovacik et al do not explicitly teach a hexagonal cell arrangement around the emitter.

Fraas et al teaches a thermophotovoltaic generator in which a polygonal array of thermophotovoltaic cells surrounds the emitter for absorption of the emitted radiation. (Abstract; Figure 2 shows an octagonal embodiment)

It would have been obvious to one having ordinary skill in the art to modify the system of Kovacik et al by specifically mounting the thermophotovoltaic cells in a polygonal array around the emitter, as taught by Fraas et al, because Fraas et al teach the effectiveness of this arrangement in absorbing the radiation emitted from a cylindrical emitter similar to that of Kovacik et al. (Compare Fraas et al Figures 2 and 3 with Kovacik et al Figures 2 and 3) Selection of a particular polygonal cross section (i.e. square, hexagonal, octagonal, etc.) would be a matter of design choice to one having ordinary skill in the art, dependent on the dimensions of the emitter and available cells, as well as the desired spacing of the cells from the emitter.

Response to Arguments

14. Applicant's arguments filed 8 April 2008 have been fully considered but they are not persuasive.

Applicant argues that Kovacik does not teach an expansion step. The examiner respectfully disagrees. Such an expansion step is clearly present directly above SiC tube 26 as illustrated in Figure 3. Applicant further argues that the "step" indicated in the rejection is not configured to generate a significantly even temperature distribution on an outer wall of the combustion chamber and is not internal to the combustion chamber. As the emitters disclosed by Kovacik form an outer wall of the combustion

chamber, and these are disclosed as good thermal conductors, it is the Examiner's position that a significantly even temperature distribution is present on an outer wall of the chamber as a result of this thermal conductivity and the combustion provided by the burner, which includes an expansion step, as indicated in the rejection above. The configuration therefore provides the claimed effect, and the limitation is considered to be met. Regarding Applicant's assertion that the step is not "internal" to the combustion chamber, the Examiner considers the combustion chamber of Kovacik to comprise the volume bounded by emitter 28 in Figure 3, including burner 24 and tube 26. The expansion step of Kovacik is clearly "internal" to this chamber.

Applicant further asserts that the effect of the step provided by the instantly claimed generator cannot be achieved by Kovacik. The limitations pertaining to the intended function of the claimed structure are to be given limited weight. A recitation of the intended function of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim. See *In re Casey*, 152 USPQ 235 (CCPA 1967) and *In re Otto*, 136 USPQ 458, 459 (CCPA 1963). As all structural limitations are met by Kovacik, in the absence of persuasive evidence to the contrary, the Examiner must take the position that the intended function will be provided by the prior art structure.

Applicant further asserts that the "step" indicated in the rejection is formed of two components, burner 24, and SiC tube 26, and combustion only takes place in the burner. Again, the Examiner reiterates that limitations to the intended function of the

device cannot be given undue weight in apparatus claims. Regardless, Applicant's claims are limited to "an internal chamber where combustion occurs, the internal chamber having an internal expansion step". It is abundantly clear that structures 24 and 26 define an internal chamber where combustion occurs, and having an internal expansion step exactly as claimed. There is simply no structural distinction between the claim and the prior art.

Applicant further provides several arguments pointing to the function of the claimed expansion step in contrast with that of Kovacik. Such arguments are immaterial to the rejection, as all structure provided in instant claim 1 is provided by Kovacik.

Applicant argues that Kovacik does not disclose even temperature distribution. The Examiner again respectfully disagrees. Emitter 28 of Kovacik is disclosed as a good thermal conductor (Paragraph 0027), and defines an outer wall of the combustion chamber. Simply by virtue of its thermal conductivity, the emitter will have a "significantly even temperature distribution", broadly recited.

Applicant argues that Kovacik does not disclose an emitter formed as part of a chamber wall. As pointed out above, emitter 28 is considered to provide an outer wall to the combustion chamber which lies within. Whether or not there is a space between elements 24/26 and emitter 28 is immaterial to the rejection. The structure of Kovacik reads on that instantly claimed, particularly as Applicant's claims do not exclude the emitter from forming an outer wall of the combustion chamber.

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Jeffrey T. Barton whose telephone number is (571)272-1307. The examiner can normally be reached on M-F 9:00AM - 5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeffrey T. Barton/
JTB
18 June 2008